

# Patient-Staff Safety Applications: The Evaluation of Blue Code Reports

## *Bir Hasta ve Çalışan Güvenliği Uygulaması: Mavi Kod Raporların Değerlendirilmesi*

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### Abstract

**Objective:** Blue code systems (BCS) are communication systems that ensure the most rapid and effective resuscitation when a patient is in respiratory or cardiac arrest. A hospital employee faced with the situation of a cardiopulmonary arrest (CPA) starts the system by dialing 6666 from any phone in the hospital. We created a five-person team that includes a doctor, nurse, anesthesia technician, stretcher officer and security guard. The purpose of this study is to share our experiences in initiating the use of the BCS in our hospital.

**Materials and Methods:** In our hospital, the records of calls that were made by Callvision BCS were analyzed retrospectively from May 2010 to the end of January 2011.

**Results:** A total of 474 calls were made using the blue code system. Of those calls, 402 (84.5%) were determined to be inappropriate calls. The remaining 72 calls were responded to. Of the 72 patients who were treated, 21 were discharged after they were hospitalized in the service or intensive care unit, 45 cases resulted in exitus, and 5 cases were referred to the Ataturk University faculty of medicine.

**Conclusion:** The BCS has achieved its goal. The discharge rate of 29.5% that we achieved is a successful result.

**Key Words:** Resuscitation, cardiopulmonary resuscitation, blue code

### Özet

**Amaç:** Mavi Kod sistemleri, bir hastanın solunumsal veya kardiyak arresti durumunda, hastaya en hızlı ve verimli resüsitasyonu sağlamaya yönelik çalışan iletişim sistemleridir. Bir kardiyopulmoner arrest durumu ile karşılaşan hastane çalışanı hastanedeki herhangi bir telefondan 6666'yı aradığı zaman sistemi tetiklemiş oluyor. Biz, doktor, hemşire, anestezi teknisyenleri, sedye görevlisi ve güvenlik görevlisinden oluşan beş kişilik bir ekip oluşturduk. Bu çalışmanın amacı hastanemizde başlattığımız mavi kod sistemi ile ilgili deneyimlerimizi paylaşmaktır.

**Gereç ve Yöntem:** Hastanemizde Callvision mavi kod sisteminden elde edilen kayıtlar, Mayıs 2010'dan itibaren Ocak 2011 sonuna kadar retrospektif olarak incelendi.

**Bulgular:** Mavi kod sistemi kullanılarak 474 arama yapıldı. Bu çağrılardan, 402'sinin (84,5%), uygunsuz çağrı olduğu tespit edildi. Geri kalan 72 olguya müdahale edildi. Bu 72 vakadan, 21 vaka servis ya da yoğun bakım ünitesinde yatışı sonrası taburcu edildi, 45 olgu exitus ile sonuçlandı ve 5 olgu Atatürk Üniversitesi Tıp Fakültesine sevk edildi.

**Sonuç:** Mavi kod sistemi hedefine ulaşmıştır. Çalışmamızda elde ettiğimiz 29,5%'lik taburculuk oranı başarılı bir sonuçtur.

**Anahtar Kelimeler:** Canlandırma, kardiyopulmoner canlandırma, mavi kod

### Introduction

The environment we live in can be decisive in terms of potential threats to life. According to an article published in 2001 by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), "health care occupations rank third" in the rankings of the riskiest jobs on earth. One in every 500 people who go into a health care facility die. The blue code, which has been developed to reduce the risk of health care fatalities, is equivalent to emergency health and rescue services in a hospital.

Blue code systems are communication systems that ensure the most rapid and effective resuscitation of a patient

in respiratory or cardiac arrest. The blue code is a warning system technology used for resuscitation, but personnel training and code procedures are important for those in charge of the blue code systems in the hospital. For blue code systems to function effectively and to "save lives", when a blue code situation occurs in a hospital (due to a respiratory or cardiac arrest incident), personnel must identify the situation and call experts to the scene. To alert the experts, one of the following methods is used: the internal telephone system, push-button system, pagers, hospital paging systems, or cordless telephone systems. For legal purposes, the hospital must shorten the duration of time before treatment, detection, and follow-up. The information about each blue code situation's time,

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event location, and routing should be recorded. Additionally, to monitor the efficiency of the detection of blue code situations, all the post-event outcomes must be recorded. To improve the quality of the application and utilization of blue code systems and bring about shorter response times, the notification forms that detail the treatment of the blue code status must be available and a variety of performance reporting data must be examined.

As of April 29, 2009, 27,214 healthcare institutions and agencies exist. The procedural guidelines and principles related to ensuring patient and employee safety and protection, the process of basic life support, and the issues concerning the implementation of blue code systems are defined in article 16. Accordingly, the team consists of a doctor, a nurse, an anesthesia technician, a stretcher officer, and a security officer. During working hours, there is also one expert from the field of anesthesia, cardiology, neurology, pulmonary diseases, internal medicine and general surgery or, in absence of these specialists, the medical examiner's team leader, who is appointed by the administration. According to a new guideline that was published by the Official Gazette numbered 27897 and dated 04.06.2011, in each team, a doctor, a person trained in cardiopulmonary resuscitation (CPR), and a health care employee should be on the hospital grounds.

A hospital employee faced with the situation of a cardiopulmonary arrest (KPA) activates the system by dialing 6666 (blue code) from any phone in the hospital. The call appears on the screen of the pager devices of the duty team, in the form of an address. The duty team goes to the address that appears on the screen. Until the team is on the scene, the employee that made the call provides basic life support to the patient. When the team reaches the scene, the hospital employee ends the call with the same phone. After the intervention is completed, a report related to the incident is logged in the system.

Erzurum Regional Training and Research Hospital has 128.802 square meters of indoor space, 150.046 total square meters of property, and seven-stories. Apart from polyclinics and units within the polyclinics, there are other service units, such as the cafeteria and florist. It is the largest hospital in the eastern Anatolia Region. Daily patient entry was approximately 4,000 in 2011, and the hospital had 10,000 visitors when you include the staff and the patients' relatives. In our hospital, until December of 2009, the anesthesia technicians studied resuscitation. In accordance with the notification of the Ministry of Health, the hospital administration made the decision to establish the blue code, and from January of 2010, the hospital started the educational process by creating teams. In May 2010, a study was initiated with the Callvision Blue Code System, which was to be integrated into the hospital with a digital system.

Resuscitation should not be seen as a process that is only performed by doctors. All resuscitations that are performed in a hospital require a team. We created a five-person team that included a doctor, a nurse, an anesthesia technician, and a security guard. During working hours, expert doctors were included, and outside of working hours, practitioners and physicians assistants were appointed. In addition, basic life support training was provided to each person on the staff, whether they were medical personnel or not. Re-training in basic life support is ongoing for personnel in 2011, according to a new algorithm, published in October of 2010. The system in our hospital is the Callvision Blue Code system, and all the recording and reporting is performed automatically. We use pagers to call the team to the location of the blue code.

The purpose of this study is to share our experiences in initiating the use of the blue code system in our hospital. The system has been used in health care systems all over the world for many years, and we started to use it in our country in 2008.

## Materials and Methods

The records of calls that were made in our hospital by the Callvision Blue Code System were analyzed retrospectively from May 2010 (the date of the establishment of the computer-based blue code recording and reporting system) to the end of January 2011. The data are presented as means $\pm$ standard deviation and as % of n. The frequency figures were created from the data using SPSS 17 statistical software.

## Results

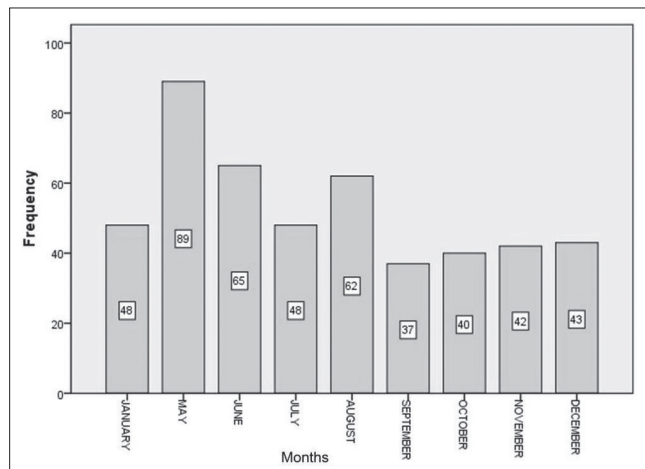
Between May 2010 and the end of January 2011, 474 calls were made using the blue code system. Of those calls, 402 (84.5%) were determined to be inappropriate. The remaining cases (71 calls) were responded to. The average treatment time was 31.4 $\pm$ 2.25 minutes. The distribution of the applications of the blue code system by month was unremarkable except for the excess resulting from the test calls (Figure 1).

When we evaluated the floors the calls were made from, it was revealed that most of the calls were made from the ground floor (Figure 2).

Of the 71 patients who were treated, 21 were discharged after they were hospitalized in the service or the intensive care unit (Figure 3).

Of the total 474 calls, 58.2% (n=276) of the calls were made during working hours, and 41.8% (n=198) of the calls were made during non-overtime hours (Figure 4).

Most of the calls were made from the services according to the locations of the calls (Figure 5).

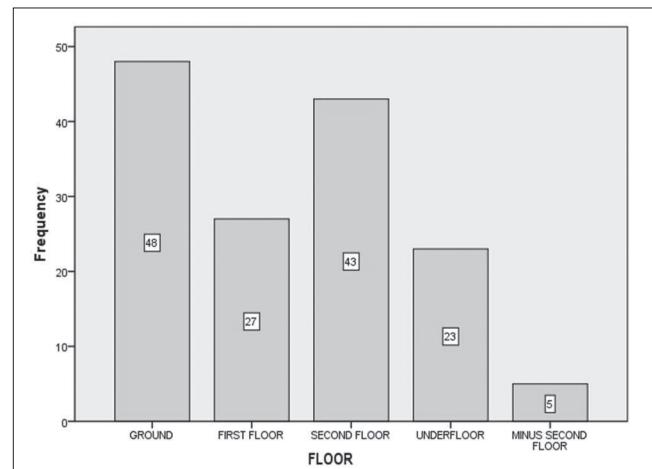


**Figure 1.** The distribution of calls according to months.

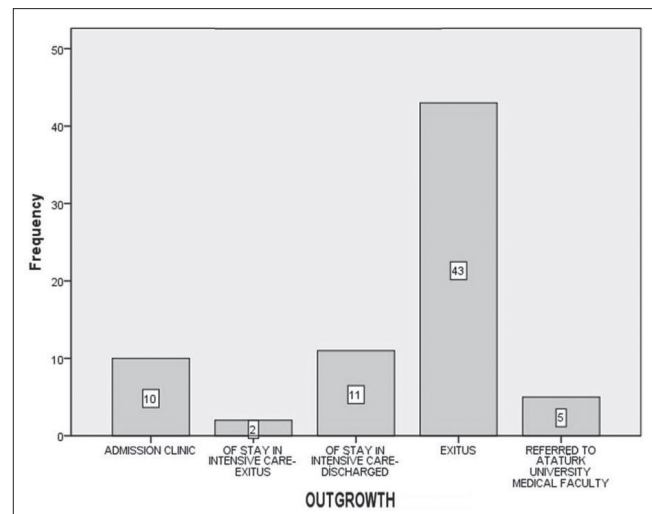
## Discussion

The blue code system has been successful in achieving its purpose in our hospital. Of the 474 total calls, 402 were considered inappropriate. A study by Huerrera et al. [1] showed that eight inappropriate calls were reported in 73 patient code calls. Keernested et al. [2] stated that 231 of the 311 calls were inappropriate in their study. Canural et al. [3] did not evaluate the number of inappropriate calls. However, in this study, 61% of the code patients were not considered to be experiencing a life-threatening event, but medical treatment was applied, and 13% were treated on site rather than being transported to the emergency room [3]. As a result, the rate of inappropriate calls was 74%. In our study, the rate of inappropriate calls is very high, and these inappropriate calls are an obstacle to the effective use of the blue code system.

A total of 71 calls were genuine cases of cardiac or respiratory arrest; 21 of those cases were discharged, 45 resulted in exitus, and 5 were referred to the Ataturk University faculty of medicine. Aune et al. [4] reported a discharge rate of 29% in hospital cases that applied CPR over a four-year period in Sweden. Bal et al. [5] reported that 137 cases were coded, 90 survived, 45 resulted in exitus, and 2 were transferred to Professor Dr. A. İlhan Özdemir State Hospital in Giresun. Canural et al. [3] found that 26% of 23 patients for whom a blue code was called were experiencing a life-threatening condition. Of the 71 patients we treated, 10 were hospitalized into services and 13 were hospitalized into the intensive care unit. The patients hospitalized into the services composed 11% of the patients in intensive care, and 21 patients were discharged. In the study by Huerrera et al. [1], 55% of patients were hospitalized into intensive care, and 35% of hospitalized patients were discharged. In the study by Garcia et al. [7], the rate of discharge for hospitalized patients was



**Figure 2.** The distribution of calls according to floor.



**Figure 3.** The distribution of calls according to outgrowth.

20%. In the study by Kaernested et al. [2], 69% of the treated patients were hospitalized into the intensive care unit; and 33% of these were discharged. In our study, 29.5% (n=21) of the treated patients were discharged, which shows that our system is successful. We consider the patient discharge rate, particularly after hospitalization in the intensive care unit, as one of the criteria for the success of the blue code system.

The average response time was 4.31±/ 2.25 minutes in our study. The time was fixed at 2.17 minutes in Bal et al.'s study [6] and at six minutes in Canural et al.'s study [3]. In Garcia et al.'s study [6], 90 patients were treated within one minute. Because our hospital is large, we reached the patients in an acceptable amount of time, but our goal is to reach each patient within three minutes in the future.

When we evaluated the density of the calls for each floor, we observed that most of the calls had been made from the

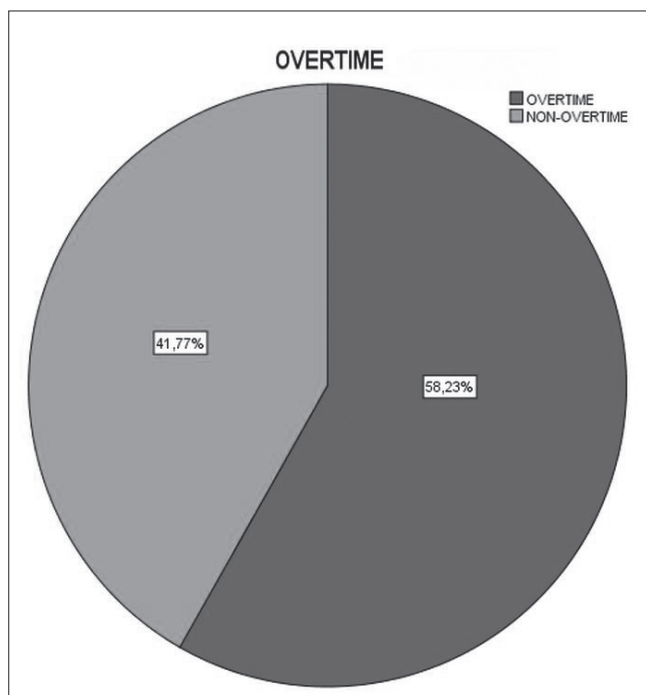


Figure 4. The distribution of calls according to overtime.

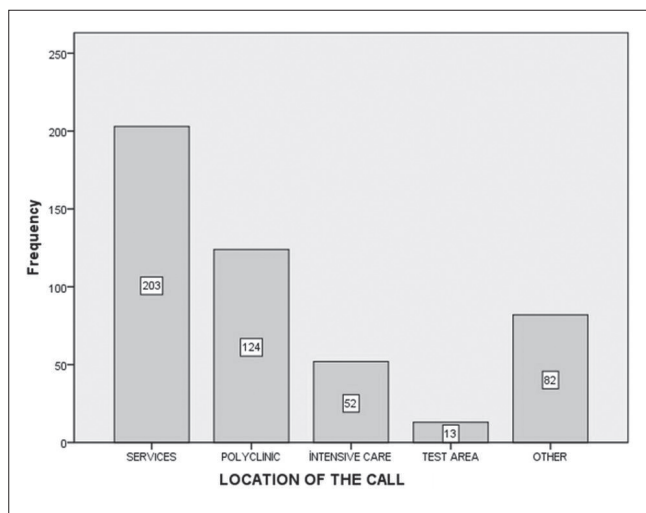


Figure 5. Location of call.

ground floor, 32.9% (n=48). We attribute this to the fact that the polyclinics are located on the ground floor with the bank, post office, and patisserie, which are areas of social life. No previous study has identified the floors from where emergency and blue code calls were made.

According to the location of the calls, it is understood that most of the calls were made from the services with a rate of 42.8% (n=203). The number of calls made from the units

where the patients were hospitalized is normal. Although a blue code call can be made from the intensive care and emergency services, the staff of those departments treats blue code patients in these areas, except when the patient population is high. Therefore, the blue code calls made from the intensive care and emergency units were lower than the calls made from the services. The areas of social life were other significant locations from where the calls were made. is the patients undergoing cardiac or respiratory arrest in these areas are the riskiest cases because they are not in the polyclinic, services, or intensive care, and there are no health care providers available to treat the patients. Because the transportation of the patient is slower, due to the fact that there is not a blue code system in these areas, the chance of resuscitation success decreases.

In conclusion, the blue code system has achieved its goal. The discharge rate of 29.5% (n=21) that we achieved is a successful result. Our next goal is to reach each blue code patient within three minutes. The most significant problem of the current system is the number of inappropriate calls. To achieve our goals, we must decrease the number of inappropriate calls and continue the periodic in-service basic life support training.

**Conflict of interest statement:** The authors declare that they have no conflict of interest to the publication of this article.

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